**Storage of Aluminium Electrolytic Capacitors**

I have been asked to research the shelf life for aluminium electrolytic capacitors to enable a LOP to be written containing guidelines for storage of these components within KBRS. This is an agreed action in response to an NIR incident report.

Aluminium electrolytic capacitors consist of two aluminium foils, one cathode and one anode, separated by a paper spacer infused with liquid electrolyte. The two foils and the spacer are stacked like a sandwich and then tightly wound into a roll which is placed inside an aluminium can and then sealed with a rubber or epoxy bung.

Due to the nature of their construction and the way they are manufactured, aluminium electrolytic capacitors are especially susceptible to degradation during storage (reducing their shelf life). The two degradation modes are: electrolyte evaporation and dielectric dissolution. Rate of degradation is very dependent on temperature and is faster at higher temperatures. Electrolyte evaporation is the gradual drying out of the liquid electrolyte. Dielectric dissolution is the process by which over time the dielectric slowly dissolves back into the electrolyte solution when there is no bias voltage applied.

Different manufacturers offer slightly different advice regarding the storage life time. Most give a specified time under defined environmental conditions for which capacitors can be stored without having to undergo ‘reconditioning’ before being used without risk of premature failure. Reconditioning normally involves the application of rated voltage via a series current limiting resistor for a defined period of time, often followed by the application of rated voltage. Setting up a workstation to do this plus the associated labour costs would almost certainly make this uneconomic when compared to just procuring new parts.

The following guidance has been taken from manufacturer’s data for storage times before re-conditioning is required:

**Vishay** – no pre-conditioning will be necessary for Vishay BC components aluminium capacitors, when stored under standard atmospheric conditions (15°C to 25°C; 25% to 75% RH; 860 mbar to 1060 mbar) for 3 years for non-solid 85°C types and for 4 years for non-solid 105°C types.

**Nichicon** - recommend not > 2yrs at 35°C, but data claims no degradation after 3yrs.

**Hitachi** – recommend up to 3yrs at 35°C.

**TDK / Epcos** - recommend not > 2yrs at 35°C.

**Cornell / Dubilier** – for CDE Alu types < 3yrs at 35°C, 60% RH; for CDM types up to 5 yrs at 5°C to 40°C, 75% RH.

In summary, shelf life / storage time does vary according to the actual series and storage conditions. Most seem to state a figure for storage at 35°C. Since storage within KBRS is likely to be at a lower temperature, shelf life will be slightly longer. I would recommend that as a general rule that we store electrolytic capacitors for no longer than 3 years before use.

RJC 12/12/18